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ABSTRACT

This document provides a set of generalized guidelines for the design of units in large family campgrounds. Managers of recreational lands have two responsibilities and goals: to protect the natural resources, and to provide an enjoyable experience for users. With these goals in mind, unique variables to each unit such as shade, site aesthetics, and understory vegetation must be considered by careful and frequent onsite inspections. The following unit design factors are discussed: (1) site selection; (2) unit size; (3) unit construction; (4) unit furniture placement; (5) type of unit; (6) ramps and risers; (7) shade; (8) screening; (9) water movement; and (10) signs. Three basic unit designs are considered: the back-in, the pull-through, and the pull-off. Line illustrations depict unit base construction, surfacing, and placement of furniture (grill, electrical hookups, and tables). An appendix on tree and shrub response to recreation use ranks 27 hardwoods and conifers. (PG)

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CAMP UNIT DESIGN GUIDELINES

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CAMP UNIT DESIGN GUIDELINES

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There are probably as many solutions to the challenge of how to design quality camp units as there are plots of developable land. Each individual location with unit development potential should be considered on its own merits according to the type of user for whom the unit (and therefore the campground) is being planned. Campers in an off-road vehicle area, a wrangler's camp, and a lakeside fishermen's campground all require different types of campsites; these all differ from sites in a family campground.

This publication is concerned with the design of units in large family campgrounds. The users usually consist of one or more families. Their equipment ranges from small tents to large recreational vehicles (R.V.'s) 45 to 50 feet long, including the tow vehicle.

A word of caution is in order: The intent of this document is to provide a set of generalized guidelines for unit design. Specific developments require individual attention. It is not plausible to develop a quality camping unit without the integral step of field design. Factors including shade, site aesthetics (such as scenic vistas), and understory vegetation must be considered in final site design and layout. These and other considerations can be analyzed effectively only after careful and frequent onsite inspections.

The ultimate goal of quality unit design is twofold: Managers of recreation lands have the dual responsibility of protecting natural resources and providing an enjoyable experience for users. Following is a "laundry list" of considerations aimed at meeting this challenge.

Site Selection

TVA's Land Between The Lakes recommends the following procedure: After consideration of alternatives, determine optimum traffic flow patterns (potential unit locations should be a determining factor in road locations). Design, lay out, and clear the right of way for the access road on which units are to be constructed. After the right of way has been cleared, a knowledgeable planner or design team should go to the field and determine where to place individual units. The perimeter of each unit should be marked and the entire site cleared, leaving a screen of understory vegetation between each site (see Screening). Once these enclaves are cleared, the outline of each unit may be staked for construction.

Unit Size

The size of a camping unit is largely contingent upon the physical characteristics of the site. If funds and heavy equipment are available units may be constructed on marginal land. However, sites requiring a minimum of heavy construction, such as extensive cuts and fills, are preferable. Assuming an adequate land base, a good rule of thumb for unit size (excluding the parking spur) is a minimum of 25 by 25 feet, or 625 square feet. Units may (and often should) be larger when possible. Small units are acceptable, and may be preferred over the alternative of extensive cosmetic work on the land base. A site

25 by 25 feet should be large enough to contain the equipment used by a single camping family. Development of some units smaller than this will allow maximum utilization of the land base while larger units provide space for two-family occupation. (Approximately 37 percent of the users at family campgrounds at Land Between The Lakes are dual family or larger groups.)

TVA's Land Between The Lakes recommends that all camp units (at developed sites) be designed to allow use by campers with all types of equipment. Research (Conover 1977) indicates tent and trailer campers readily accept camping in close proximity to each other, at least up to 10 units per acre. Additionally, multipurpose units preclude the need for separation of users by equipment type, a time- and money-consuming administrative problem.

Unit Construction

Construction guidelines given here are those utilized at Land Between The Lakes. Factors such as agency requirements and availability of materials should be considered for individual developments. Units at Land Between The Lakes are constructed as follows: If the selected site contains localized topographic problems, such as a minor drainage or depression, it is graded fairly level. If these or similar problems do not exist, construction begins with the second step: A layer of creek or river gravel is placed on the site to serve as a base for the unit. The length and width of this base contain the space designed for the living and parking area of the unit, plus an additional 2 to 3 feet of outsloped perimeter for use in the final "dressing" of the unit (Figure 1). Depth of the gravel base depends on the lay of the

land. If a fill is required, portions of the base may be several feet deep. On level ground, six inches generally is adequate. In some areas the cost of river gravel may be prohibitive. In these instances, earth fill may be substituted for much of the gravel. However, the top three to four inches of fill should still be gravel to retard settling.

Place the unit surface on top of the base. This surfacing material consists of two grades of limestone rock. The larger grade, a 10-32 limestone (roughly one-fourth to one-half inch aggregate size), is used on the parking spur of the unit. (Land Between The Lakes paves camping loop roads--for dust abatement--but not parking spurs. Except in sand, paved spurs are generally unnecessary.) The living area of the unit is directly adjacent to (and not barricaded from) the parking spur. The design philosophy at Land Between The Lakes is to avoid second-guessing how the user will want to organize his living space. What a designer may envision as the ideal location for a tent may not suit user preferences. Therefore, units are designed without separating the parking spur from the unit living space, allowing users to design their own space (Figure 2). This living space is covered with a layer of limestone fines, or manufactured sand--a flaked limestone rock with an aggregate size of roughly one-eighth inch (Figure 2a). Grade the unit surface level (with the exception discussed in "ramping," page 10) and outline with a border of railroad crossties. Anchor the crossties by means of 30-inch reinforcement bars driven through holes in the ties into the base material of the unit. (When construction costs permit, the use of penta-treated crossties is advised.) Units with crosstie borders are preferred by users, primarily because the crossties serve to define the unit

and serve as "property lines" (Hultsman 1976). From a management standpoint crossties serve psychologically to contain users to a reinforced area reducing impact on the surrounding land base (Hanna 1976), thus protecting the adjacent environment and minimizing maintenance.

Once the site is bordered, give the outsloped base a final dressing, install a picnic table and a ground-level, tilt-back grill (see Unit Furniture Placement), and the unit is ready for use.

Unit Furniture Placement

The policy at Land Between The Lakes is not to force users into a predetermined arrangement of their living space. Figure 4 illustrates how unit furniture may be placed to allow user-designed utilization of space. Tucking the furniture into a corner of the unit frees the remainder of the space for the user to place his equipment (tent, trailer, dining fly, vehicle, bicycles, lawn chairs, play pen, etc.) as he pleases. Afternoon shade should be considered in determining furniture location.

Research (Shreve 1977) indicates only about 20 percent of campers actually use installed grills as their primary cooking implement (80 percent use portable stoves or cooking units installed in their R.V.). Thus, a ground-level, tilt-back grill is recommended for use. While cooking is not likely to increase on these grills, they do function to management's advantage by providing a single, reinforced spot within each unit on which the user can build his campfire. (While not used extensively for cooking, campfires are built by most campers--70 percent during a June-August sample--for atmosphere, insect controlling, or warming.) The use of tilt-back grills satisfies the needs of those

campers who wish to use their grills for cooking purposes, and also helps preclude unsightly "fire spots" dotted over the unit. In the study cited, users who camped on sites with stand-up picnic grills built campfires either on the gravel surface of the pad (52 percent) or completely off the pad (48 percent). On units with a tilt-back grill, 2 percent of the users built campfires on the gravel camping pad, while 98 percent used the circular cement grill pad.

Set the tilt-back grill (several models are available commercially) in a cement form, 4 feet in diameter, built into the base material of the unit so, when the unit is surfaced the top of the cement form is flush with the top of the camp unit surfacing material. We recommend construction crews be instructed to set the grills so the grate, when upright, is not between the user's campfire and the unit's picnic table (Figure 3). We also recommend a circular form, which suits the shape of a campfire better than a rectangular form.

Picnic tables should be placed so the end nearer the grill pad is about 5 to 6 feet from the center of the grill. This spacing leaves adequate room between the end of the table and the fire, without wasting space. The best type of table seems to be a concrete slab top, 8 feet long, with wooden benches. The concrete slab is relatively maintenance free and the wooden benches are warmer in cool weather than are concrete benches.

If electrical hookups are provided, they should be placed where they may be reached easily from the left-hand (driver's) side of the R.V., at the rear (Figure 4).

Garbage cans may be provided for every unit, although they should be clustered in groups of three to four cans at carefully selected points along the road rather than adjacent to each unit. This speeds up collection by reducing the number of pickup sites. Garbage collection time may be further reduced by providing centrally located Dumpsters for each camping loop. A single Dumpster should serve approximately 25 camp units.

If potable water is provided, costs may be reduced by placing common-use fountain and faucet combinations along the road. Depending on the density of the units (number per acre), one outlet for each 5 to 7 units should suffice.

Type of Unit

Three types of camping unit designs are suitable for the diverse clientele camping today. These are the back-in, the pull-through, and the pull-off (Figure 4).

Back-in units are the most space-efficient of the three. Also, research indicates users prefer this type (Hultsman 1976). Back-in units function well on either side of a loop road provided that the angle of the spur-road juncture is acute on the short side of the spur. Occasionally, the lay of the land may dictate a 90 degree spur-road juncture. A back-in unit perpendicular to the road may be made functional if the spur can be flared wide where it meets the road. Any angle greater than 90 degrees on the short side of the spur creates a pull-in unit which is not acceptable. (When a car enters a pull-in unit, the trailer is behind it; this precludes leaving the

unit by car without moving the trailer). On a back-in unit, the spur should be a minimum of 10 feet wide (preferably 12 feet) and, when possible, 50 feet long to serve the large R.V.'s in use today.

On all types of units the living space should be to the driver's right as he enters the spur. Most R.V.'s have doors on the right-hand, or passenger, side of the vehicle. Thus, the design goal here is to allow the user to exit his R.V. directly onto the unit.

The pull-through unit requires more space than other acceptable types, but is the easiest for an inexperienced user to enter and exit. It functions well on either side of a two-way road, but only on the right-hand side of a one-way road. (See Appendix 1, TVA-Land Between The Lakes Camping Design Quiz, for an in-depth look at functional and nonfunctional units.) As with back-in units, the entrance and exit should be at least 10 feet wide. The centerline length of the parking spur should be a minimum of 80 feet. If an electrical hookup is provided, it should be located as shown in Figure 4.

The pull-off is essentially an abbreviated version of the pull-through unit. It is suited for use where a back-in is not practical and too little land is available for a pull-through. It also functions on either side of a two-way road and only on the right-hand side of a one-way road. If an electrical hookup is provided, it should be located as shown in Figure 4.

One important factor in selecting unit type is variety. A long series of identical units may give the user the feeling of being in a "rubber stamp" campground. "Cookie-cutter" design encourages monotony and prevents users from selecting the type of unit they prefer.

This does not imply that a particular type of unit should be forced onto a piece of land where it will not fit without extensive cosmetic work. Rather, unit types should be varied as the land base permits. Varying the shapes and sizes of similar type units also helps relieve monotony. Shapes may be varied by avoiding right angle corners on some units (Figure 2). Also, double-unit back-ins (Figure 5) add variety and meet the needs of dual-family units.

Land Between The Lakes currently is studying alternative designs for barrier-free camping units. The inclusion of units accessible to the handicapped will, we believe, encourage use by persons previously unable to enjoy developed-site camping. The initial barrier-free units each include an asphalt strip, three to four feet wide, inside and adjacent to the crosstie border of the unit. Additionally, one end of the picnic table top is cantilevered. Discussions with campground mangers indicate that about 1 percent of all units should be barrier-free. Some administrative control is needed, for the units should be reserved by means of a cable or other suitable barricade across the entrance. Thus, the manager can direct handicapped persons to "reserved" units. When a campground reaches 100 percent occupancy, the manager can open the unit(s) for general use.

Ramps and Risers

A situation often occurs where a plot of developable land is on a higher or lower elevation than the road. Filling (to bring a site up to the level of the road) or cutting (to lower the site) are too often used but are neither cost-efficient nor necessary.

Both practices often build maintenance problems into the site. Ramping is the preferred method of reaching a desired contour for a back-in unit from the road. Figure 6 shows a profile of how to ramp. As long as the last 25 to 30 feet of the spur and unitare level--which still may require some cut or fill--ramping will work for the user, reduce construction costs, and perhaps most important, reduce maintenance costs.

Pull-through and pull-off units also may be built above or below the road by ramping with a portion of the spur level enough to contain an R.V. If the road and spur are on one level and the living space is above or below, risers, or steps, can be employed (Figure 6). Risers should be permanent, and should extend the length of the unit to prevent accidents and the erosion that would result from foot traffic over the natural slope between the spurs and the living area. Crossties make excellent risers.

Shade

Optimum shade level depends, to a degree, on factors such as climate, orientation to sun, and campground location in the United States. For example, many campgrounds have units with natural ground surfaces. While these are not recommended, many are still in use and, therefore, require maintenance. Natural ground, particularly when heavily shaded, will not resist compaction and erosion resulting from recreation use. On units with no reinforcement, only minimum shading (about 25 percent crown cover) should be retained.

Reinforced units withstand impact well. Therefore, the amount of shade becomes primarily a matter of user preferences. Research indicates users tend to select units with a moderate amount of shade (James 1970). In the study cited "moderate" shade means about 60 percent of the area is shaded. When treating an area, thin to 50 percent to allow for vegetative growth. Make sure the remaining trees are species and sizes suited to a recreation environment (see Appendix 2: Tree and Shrub Responses to Recreation Use). Young vigorous hardwoods are best; larger trees should be cut as large old-growth trees cannot withstand the pressure of heavy use.

A second factor to consider relative to amount of shade is understory screening. Many plants, such as Japanese honeysuckle (Lonicera japonica) and smooth sumac (Rhus glabra), which make excellent screens, prefer sunlight over heavy shade.

Screening

Establishing a fairly dense stand of understory vegetation between camping units provides a number of advantages: Units in a high-density camping area (9 to 10 sites per acre) are separated psychologically from nearby sites, conveying a sense of privacy; heavy screening helps to reduce noise pollution from nearby units and support facilities, such as play courts; vegetative screening is aesthetic and helps to produce a feeling of being in the out-of-doors; screening may be used to soften the effects of unsightly natural or man-made features, such as a badly eroded bank or a sewage treatment facility; and screening can be used to "channel" people toward areas of known impact, such as trails, which can be reinforced.

One difficulty in establishing screening is unnecessary mowing by maintenance crews. They must be instructed not to mow between existing units where you are attempting to establish screens. Mowing between heavily used units may be hazardous to campers and detracts from the "natural" experience available with heavily screened units. In areas being developed, construction crews should leave existing screens.

The best sources of information on types of plants to use in specific locations are university extension services and horticulture departments.

Water Movement

One advantage of reinforced units is their ability to drain quickly. Water percolates well through manufactured sand and does not create mud on the unit. Care must be taken, however, to ensure that water does not create erosion problems around camp units. Reinforced units, since they are above ground level, can be utilized as berms, catching run-off from a watershed and channeling it around the unit. In some instances, a ditch may be required adjacent to the base of the unit.

Necessary cuts and fills may alter existing drainage patterns and create a need to rechannel water. Severely sloping ditches will require armor-plated drainage channels.

Water often is channeled along the side of a loop road. This may create problems where the road meets the spurs of camping units. Water may be moved over the spur or through a slightly depressed channel

on the spur. When the potential for erosion is great, a culvert pipe may be placed under the spur, or the road may be built at ground level and the ditch eliminated.

Signs

Signs should always be minimized. In general, only two instances require signs at individual units: Those units reserved for the handicapped should be so designated, and all units should be numbered for easy identification. In both cases, the aim is to be informative, unobtrusive, and inexpensive. Since barrier-free units (units for the handicapped) need to be kept closed by means of a cable above, an unobtrusive location for the handicapped designation is on one of the cable posts. Another suitable location for the signing--preferably a stenciled international handicapped symbol--is on the asphalt paving used for access.

At Land Between The Lakes, unit numbers are displayed on 4-inch red Scotchlite curb tape circles that are placed on either the side of the picnic table facing the road or on the electrical outlet post.

In summary, unit design is not simple. Any planning effort requires a considerable amount of conscientious thought. However, the basic concepts behind unit design are not difficult to understand. Common sense and simplicity are the watchwords of design. Units should be safe, generous, level, and usable by campers with all types of equipment.

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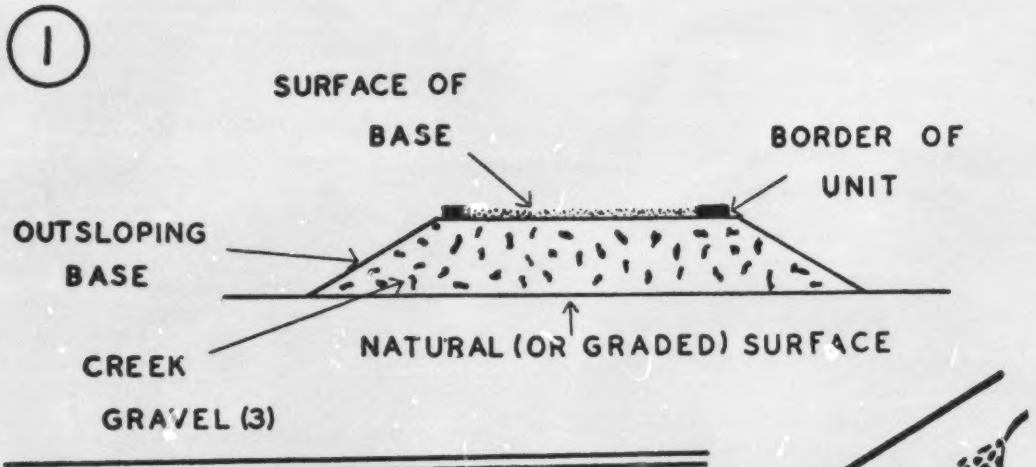
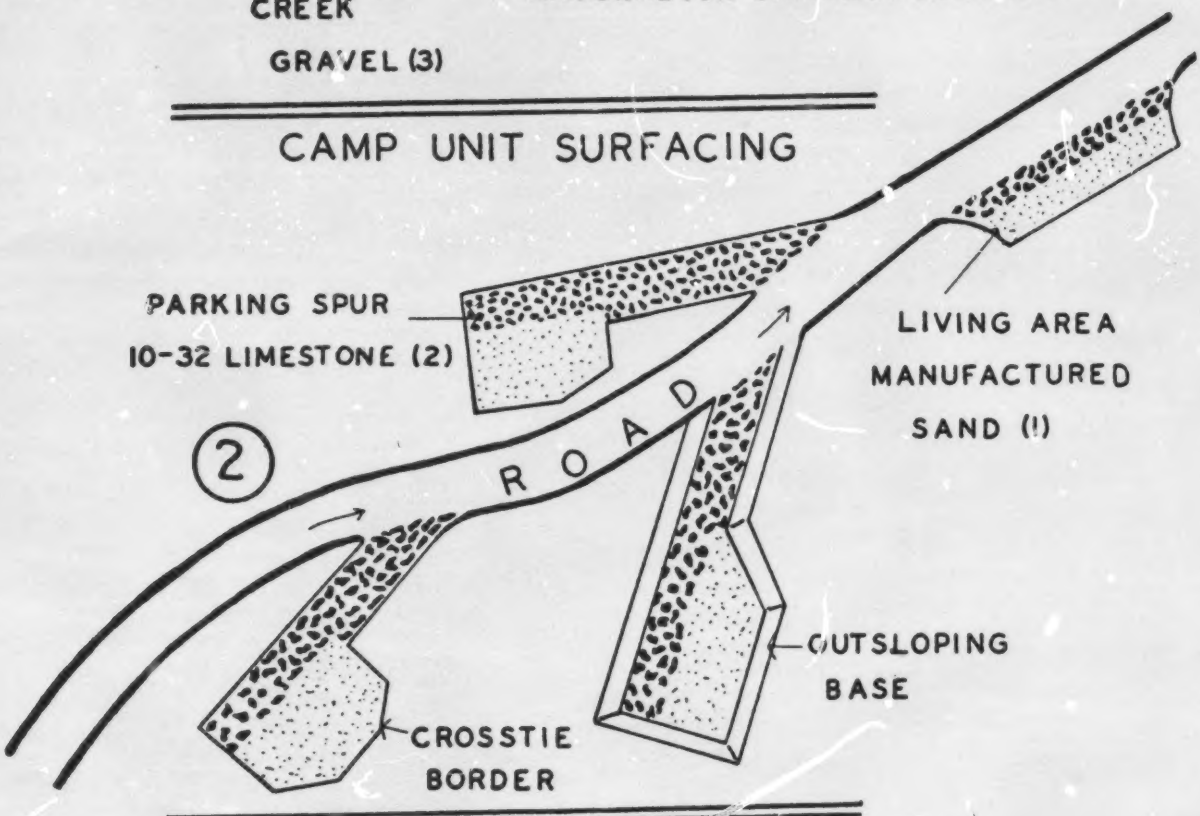
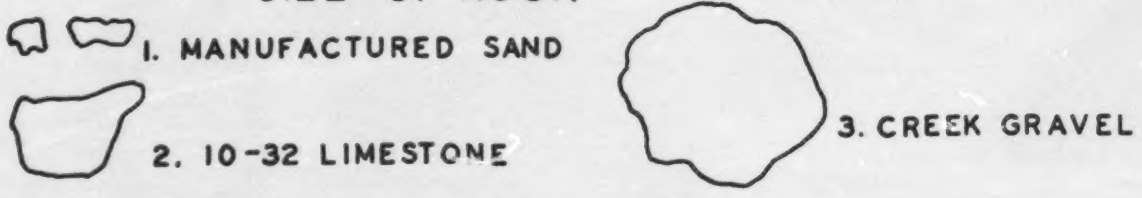
CAMP UNIT BASE CONSTRUCTION



CAMP UNIT SURFACING



SIZE OF ROCK



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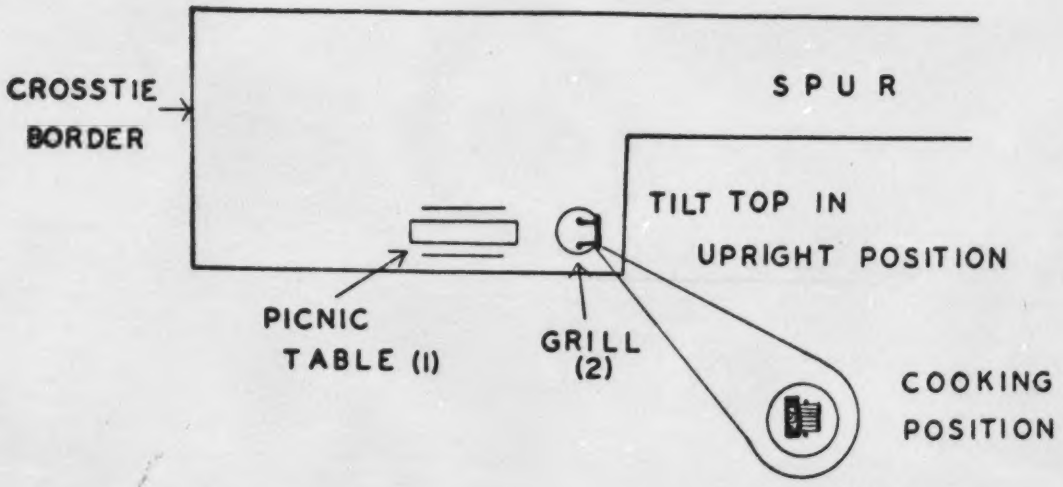
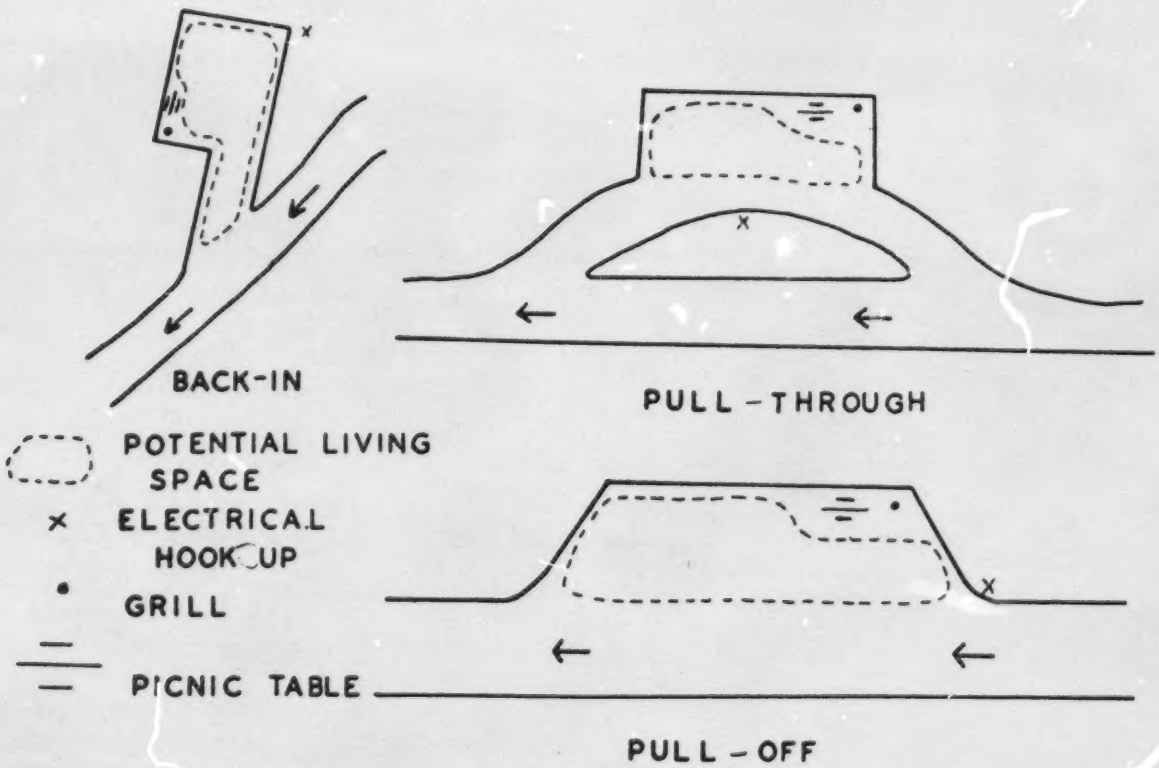
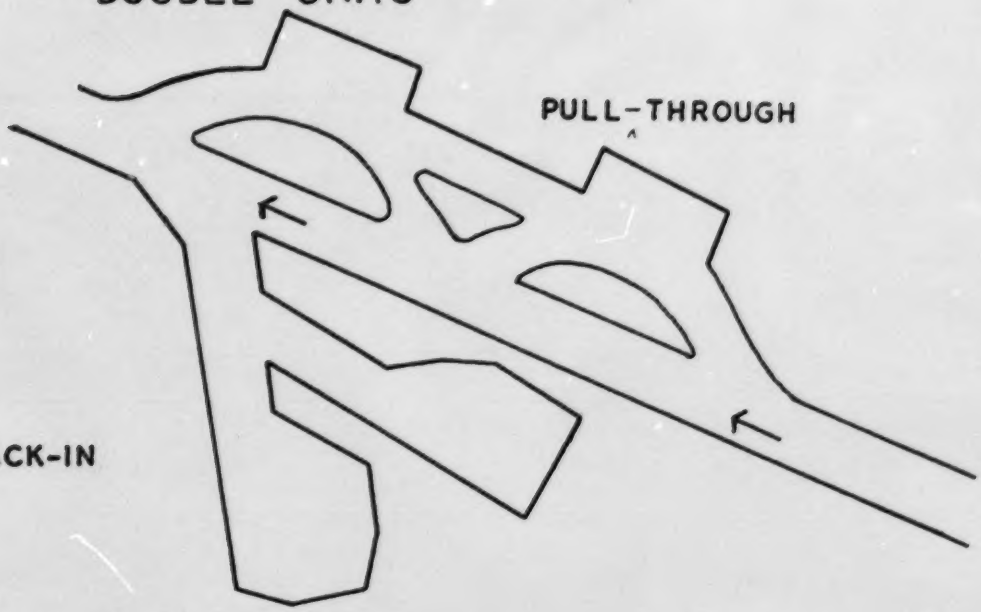
(3) PROPER PLACEMENT OF GRILL



(4) UNIT TYPES & FURNITURE PLACEMENT

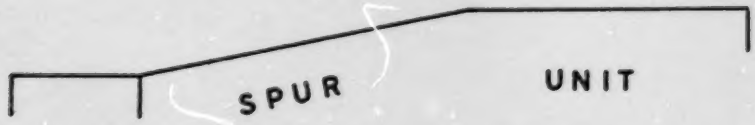


DOUBLE UNITS

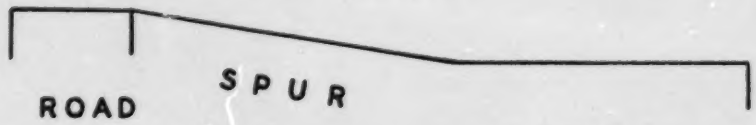


CHALLENGES OF TOPOGRAPHY

6



RAMPING UP
(UNIT ABOVE THE ROAD)



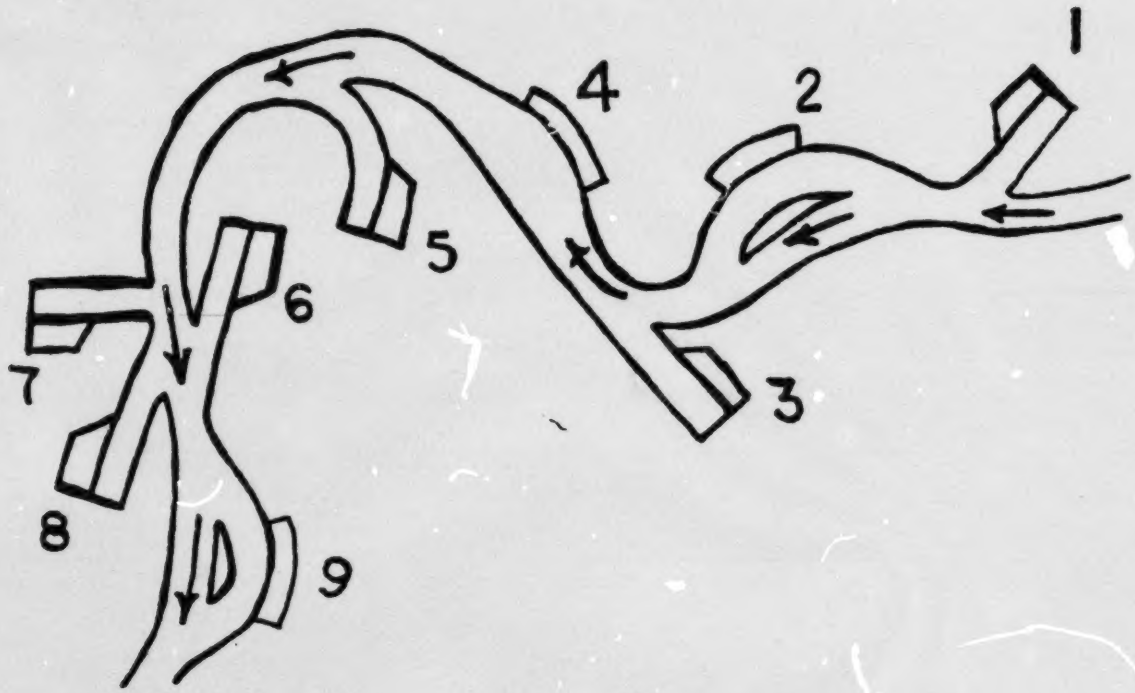
RAMPING DOWN
(UNIT BELOW THE ROAD)

RISERS

APPENDIX 1

TVA - LAND BETWEEN THE LAKES

CAMPING UNIT DESIGN QUIZ: THE GOOD, AND THE BAD, AND THE POOR CAMPER!



Ofttimes, campground planners and designers spend hard-to-come-by dollars building camping units without considering the single most important aspect of camping: The user and his equipment!

Here's a mini-quiz designed to let you test your knowledge against the "experts." Above is a diagram of a one-way road with nine camping units; some are quite good, others are poor--indeed. Circle the numbers of the units you feel are well-designed.

The answers are on the reverse side of this page.

Answers:

1. Good: A back-in unit with the living area on the right of the parking spur.
2. Good: A pull-through unit on the right-hand side of a one-way road.
3. Good: A back-in unit with the living area on the right of the parking spur; the spur joins the road as it comes out of a curve, allowing straight-in access.
4. Good: A pull-off unit on the right-hand side of a one-way road.
5. Good: The curved spur allows access to a back-in unit with the living area on the right of the parking spur.
6. Poor: The door on your R.V. opens onto the road, while the living area is on the left of the spur. (A back-in.)
7. Poor: The spur joins the road at a 90° angle; difficult to pull in or back in without a wide, flared spur.
8. Poor: A pull-in unit; how do you get to the store in your car without moving your camper?
9. Poor: A pull-through unit on the left-hand side of a one-way road lets you open the door on your R.V. and watch...traffic! Your unit furniture is behind your trailer.

In general, all camping units should be safe, generous, level, and most important, usable by all types of campers - from pup tenters to fifth-wheelers. Keep these common-sense tips in mind on your next camping trip, and when you see poorly designed units, let the camp administrator know what's wrong and why. You'll be doing him and yourself a service!

APPENDIX 2

TREE AND SHRUB RESPONSE TO RECREATION USE

Forty-two developed camping and picnicking sites on the Cherokee, Nantahala, and Pisgah National Forests were studied to determine area response to recreation use. An important phase of this study involved the measurement of the effects of such use on native vegetation.

Areas selected were 10 or more years old and contained from 1 to 21 family units per site. Unit samples were taken in 280 family units with picnic tables serving as centers for plots with ½-chain radii. All trees and shrubs in these plots were tallied by species, dominance, and diameter. Degrees of insect infestation, disease infection, and decline, except in conifers, were noted for individual trees and shrubs. Insect and disease problems were appraised on a scale from one to three (none to high); decline was scored on a scale from one to eight (none to death). Only trees and shrubs that occurred 10 or more times in the sample were included in this report.

Data indicated little or no differences in damage, or in insect and disease problems related to size or dominance of the vegetation. Differences between species, however, were consistently large. The following conifers and hardwoods are listed in order of decreasing ability to withstand the impacts of recreation use, as gaged by disease infection, insect infestation, and decline.

Species Ranking

Hardwoods				Conifers	
1.	Hickories	12.	Red maple	1.	Shortleaf pine
2.	Persimmon	13.	American holly	2.	Hemlocks
3.	Sycamore	14.	Sourwood	3.	White pine
4.	White ash	15.	Black birch	4.	Pitch pine
5.	Beech	16.	White oaks	5.	Virginia pine
6.	Sassafras	17.	Black walnut		
7.	Buckeye	18.	Red oaks		
8.	Yellow-poplar	19.	Black locust		
9.	Dogwood	20.	Magnolia		
10.	Blackgum	21.	Black cherry		
11.	Yellow birch	22.	Blue beech		

Not reflected in the listing are important group differences between conifers and hardwoods. Conifers were clearly more susceptible to disease and insect attack than were hardwoods--with the possible exception of shortleaf pine and hemlock. Apart from the disease and insect problems, the dense shade produced by conifers apparently induced greater site degradation. White pine had serious disease problems (Fomes annosus) that greatly limit its usefulness in recreation areas. Among the hardwoods only sassafras appears unrealistically ranked. A short-lived species, this tree rarely reaches a position of dominance or codominance and frequently succumbs quickly, and is a poor risk in wooded recreation areas.

Though not shown, three shrubs in the Heath family (Ericaceae)--rhododendron, mountain laurel, and azalea (deciduous)--were important understory components. All three apparently are quite resistant to disease and insects with azalea the most, and mountain laurel the least tolerant to heavy recreation use.

(Reprinted from: Ripley, Thomas H. 1962. Tree and shrub response to recreation use. Res. Notes. No. 171, February, U.S. Forest Service, Southern Forest Experiment Station, Asheville, North Carolina.)